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22

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PRACTITIONERS OF THE NEW ECONOMICS of public finance use a rule of thumb when searching for candidates for taxation: goods and services that have low price elasticities of demand and high income elasticities of demand are likely to prove to be particularly appropriate choices. These characteristics imply that the reduction of demand (and of potential revenues) and the consequent distortion of consumption patterns resulting from the imposition of a tax will be relatively small and that the share of revenue accruing from those in the upper portions of the income distribution will be relatively large. The same rule of thumb applies when an existing program of subsidies is scrutinized to identify candidates for reduction. In this chapter we exploit this symmetry, using a Kenyan example to show how such an assessment might be conducted in the education sector.

That education expenditures should be subjected to critical scrutiny is obvious: public spending on education as a proportion of GDP and as a proportion of public expenditure is high in all regions of the world. In 1970, on average, developing countries spent 4 percent of GDP and 15 percent of total public expenditure on education (Zymelman, 1982). Moreover, enrollment ratios that remain low by comparison with those of industrialized countries, combined with rapid population growth and high private rates of return to investment in education, mean that demand for education (and hence pressure to increase subsidies) is high and growing.

As a consequence of the recession of the early 1980s, and as much for structural reasons, budgetary constraints on educational expenditure in developing countries are tighter than they were in the 1950s and 1960s, when many subsidy programs were put into place or were greatly expanded. Governments' share of output grew substantially over the last twenty years; today public expenditure is no longer growing as a percentage of GDP. Likewise the

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proportion of the budget spent on human resources increased in the 1960s and 1970s. Today expenditures on education and health face increasing competition from other claims (Bowman and Sabot, 1982).

There is a further reason for scrutinizing education expenditures: after twenty to thirty years of economic development, the original justification for the subsidies may not apply with equal force or may not have proven sound. The belief that the distribution of school places (and thence the rate of intergenerational mobility) should not be determined by the ability to pay school fees provided one justification for these subsidies. Capital market imperfections generally prevent the poor from borrowing to finance education expenditure.

There is also the belief that various externalities generated by the educational process drive a substantial wedge between private and social returns and that, in the absence of subsidies, investment in education would be less than socially optimal. These externalities include the compression of the earnings structure and consequent reduction of the inequality of pay resulting from an increase in the supply of human capital relative to other factors of production.[1] If, as it has been argued, education has a negative effect on fertility and on child mortality and a positive effect on political awareness and participation, then these external benefits also support subsidization (see Bowen and Sabot, 1983; Cochrane, 1979).

The need to set standards of quality in the face of inadequate information is a third reason for government regulation and possibly also subsidization of schooling. In an environment in which many parents of school children are themselves uneducated and are thus unable to reach informed judgments about the relative costs and benefits of relatively high-quality schooling, there is concern that quality will be less than socially optimal.

The public finance rule of thumb and the arguments advanced to justify educational subsidies suggest that an assessment of a program of education subsidies should address the following questions:

- Would a reduction of subsidies have a large negative impact on enrollments, or is the price elasticity of demand sufficiently low for that not to be the case?
- Would a reduction of subsidies have an adverse effect on the distribution of schooling, or contrary to intentions, have the relatively well-to-do benefited disproportionately from the subsidization of education?
- Would a reduction of per pupil subsidies result in a deterioration of school quality, or would private funds simply substitute for public funds, leaving per pupil expenditures on education inputs unchanged?

We attempt to answer these questions with regard to government subsidies of secondary education in Kenya. In so doing we will find it important to distinguish between the consequences of the two means of reducing per capita subsidies of secondary education: first, by raising fees in government schools,

and second, by leaving the growth of secondary enrollments to relatively unsubsidized private schools.

The next section presents background information on the Kenyan secondary system and program of education subsidies. The model of a dual school system suggested by the stylized facts can be used to make a prima facie case for raising user fees in government secondary schools. We then discuss the various econometric methods employed in the subsequent empirical analysis, our sources of data, and a possible problem with sample selection bias. Wage functions and educational attainment functions are used to improve measures of key relationships, to test competing hypotheses regarding the interpretation of those relationships, to estimate, using simulation techniques, the extent to which user fees can be raised, and to assess the efficacy of leaving further secondary expansion to private schools.

The Dual Secondary System in Kenya

Between 1963, the year of independence, and 1980, enrollments in the highly subsidized government secondary system expanded rapidly at 12 percent per year. Demand grew even faster than supply. The excess demand was satisfied by the establishment of large numbers of harambee, church, and private schools, which receive only small subsidies from the government.[3] Since 1963, private school enrollments, including assisted harambee school enrollments, have been growing at the rate of 21 percent. Secondary school enrollment in nongovernment schools first exceeded that in government-supported schools in 1975. In 1981, 40 percent of enrollment was in government schools, about 20 percent in assisted harambee schools and unaided harambee schools, respectively, and the remainder in church or private schools. The state secondary system is clearly the system of preference. With few exceptions, harambee schools are filled with primary school leavers who did not qualify (on the basis of meritocratic criteria) for a government secondary education. Tables 22-1–22-3, and the tables in the text below, which present characteristics of government and harambee schools for 1980, explain

Table 22-1. *Costs per Pupil, Government and Harambee Schools, 1980*
(shillings per year)

School	*Private direct*	*Public direct*	*Total direct*	*Wages forgone*[a]
Government	1,557	2,071	3,628	6,960
Harambee	2,460	227	2,687	6,960

a. Primary wages forgone, annual average over first four years, predicted with wage functions presented in table 22-8.

Source: Annual Census of Primary and Secondary Education (1979), the Appropriations Account, 1980–81.

Table 22-2. *Distribution of Highest Secondary Form Achieved, 1980*
(percent)

School	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6
Government	2.6	9.7	2.6	64.1	0.2	20.7
Harambee	9.1	40.9	8.4	40.2	0.0	1.3

Note: Rows sum to 100.
Source: Kenya Survey of Wage Employment and Education, 1980.

Table 22-3. *Distribution of O-Level Examination Scores, 1980*
(percent)

	Division					Did not
School	1	2	3	4	Failed	sit
Government	19.4	27.5	32.7	16.5	2.9	1.2
Harambee	3.2	6.3	33.3	42.9	12.7	1.6

Note: Rows sum to 100.
Source: Kenya Survey of Wage Employment and Education, 1980.

why. Table 22-1 indicates that, because subsidies are much larger in the government system than in the harambee system (2,071 shillings per student per annum as compared with 227 shillings), the cost borne by parents is much smaller in the government system (1,557 shillings per student per annum as compared with 2,460 shillings for harambee schools).[3] Moreover, government schools appear to be of higher quality. Total expenditures are roughly 1,000 shillings per pupil per annum higher in government than in harambee schools; this difference translates into better-educated teachers, smaller classes, more textbooks, and better physical facilities.[4]

The difference in inputs is reflected in differences in outputs from the two systems. Table 22-2 indicates that only 15 percent of the students in government schools drop out prior to reaching form 4; for harambee schools, the figure is 58 percent. Similarly, 21 percent of government school pupils attend upper secondary (forms 5 and 6)—the gateway to a university education—whereas the equivalent proportion for harambee schools is only 1 percent. Table 22-3 indicates that government school leavers perform markedly better than their harambee school counterparts on the standardized exam taken at the conclusion of form 4. Forty-seven percent of government school leavers scored in the top two divisions, as compared with 10 percent of harambee school leavers. Fully 56 percent of harambee leavers either placed in the lowest division or failed, as compared with 19 percent of government school leavers.

The difference between government school and harambee school leavers in performance on exams is consistent with our other evidence of a difference in school quality. It could also partly result, however, from differences in student quality, given the meritocratic selection criterion for entrance to government

schools. Although we do not have evidence on ability levels for the entire sample, a subsample of form 4 leavers was given Raven's Progressive Matrices, a test of reasoning ability that is widely used in developing countries. The results, shown below, indicate that the difference in ability scores between harambee and government school leavers is small; indeed, it proved to be statistically insignificant.[5]

Item	*Government*	*Harambee*
Mean ability	30.52	28.32
SD	4.85	7.90

Nevertheless, government school students are likely to be better qualified on entrance than harambee school students because of differences between the two groups in the quality of primary schooling and in academic skills acquired at home.

The difference between government and harambee school leavers in levels of skills measured by the exams is, in turn, reflected in a large difference between the two groups in the earnings they command in the labor market. As we see from the table below, although the predicted mean wages of workers (with ten years' experience) from both types of secondary school are substantially higher for 1980 than the predicted wages of primary school leavers, those from government secondary schools earn 23 percent more in shillings per year than those from harambee schools.[6]

Leaver group	*Wage*
Primary school	9,273
Harambee form 4	12,518
Government form 4	16,897

In the parlance of cost-benefit analysis, these stylized facts suggest that the private costs of investing in a secondary education are lower and the private returns are higher for those who gain access to a government secondary school than for those who must attend a harambee school. The resulting difference in net private returns explains parents' strong preference for sending their children to government schools. If we abstract, for now, from individual constraints on financing secondary education when the market for secondary education is segmented, the implication is that per pupil subsidies to government schools can be reduced (with user fees increased) without affecting the demand for places in government schools or the level of expenditure per pupil and hence school quality. A simple economic model of the demand for schooling predicts that, in a dual school system, there will be excess demand for places in the relatively small, highly subsidized segment of the system. The elasticity of demand in that segment will therefore be zero and will remain zero until fees are raised sufficiently to equate the private net rates of return in the two segments.[7] If the highly subsidized segment is also higher in quality, hence in gross returns, the fees charged in that segment will actually have to be higher than the fees in the other segments before net rates of return are equalized.

Raising user fees in Kenyan government secondary schools would ease budgetary constraints on education, which have tightened in the 1980s.[8] Moreover, public resources for secondary education will also be limited by the higher government priorities attached to primary and higher education. The Kenyan government is committed to free and universal primary education.[9] Whether the Kenyan government takes advantage of the revenue-generating potential of user fees in government schools, however, also depends on the consequences of a rise in those fees for the distribution of secondary school places and for the aggregate size of the secondary system. An important consideration is whether a substantial increase in user fees would force children of relatively low-income families either to transfer their children to the private school system or to terminate their education.

The predicted probability of a child's attending a government secondary school rises monotonically and steeply with the educational level of the child's parents, an indicator of socioeconomic status (probability is predicted at mean age for those born outsde Nairobi).

	Probability
Both parents with no education	.16
One parent with no education, one with primary	.23
Both primary or one with secondary or more, one with none	.33
One with primary, one with secondary or more, or both with secondary or more	.51

The probability rises from .16 for the children of uneducated parents to .51 for children of parents with at least some secondary education. Those with the greatest ability to bear the cost of their education are the most likely to receive large subsidies. The explanation may lie with differences among socioeconomic groups in the quality of primary schooling, in the quantity and quality of training provided within the home, or in the ability to "purchase" places in government schools. Whatever the cause, it appears that in Kenya the incidence of subsidies of secondary education, a private "good" that substantially raises the lifetime income of the recipient, strongly favors those households that stand relatively high with respect to the distribution of income. A rise in user fees is likely, therefore, to reduce the inequality of income (consumption) among households.

A zero aggregate price elasticity of demand (given the rationing of places) implies that a rise in user fees will not result in any underutilization of government schools. If some students withdraw from the government system, others from the harambee system will take their places in the preferred system. The nature of the change in aggregate secondary enrollments as user fees are increased, however, depends on the numbers who leave the government system and on whether they switch to the harambee system or leave the secondary system entirely.[10] These magnitudes will depend on the composition of the government system. If, at one extreme, the government system is entirely composed of the children of the group with the highest education

(income), then a rise in fees is unlikely to induce withdrawals. As we see from the table below, in Kenya, despite their low probability of attendance, children of parents with no formal education still compose 38 percent of the government secondary system, because such a high proportion of parents had little or no formal education. Another 25 percent of places are filled by children who have one parent with primary education. This statistic suggests that, unless the rise in school fees is discriminatory, that is, imposed only on those "able to pay," it may induce substantial withdrawals from the government system and perhaps entirely from the secondary system.

	Percentage of children in	
	Government system	*Harambee system*
Both parents with no education	38.2	49.0
One parent with no education, one with primary	24.6	27.1
Both primary or one with secondary or more, one with none	27.1	20.0
One with primary, one with secondary or more, or both with secondary or more	10.1	3.9

Methods and Data

Our concern is with the apparent dualism in the market for secondary education between the high-quality, high-subsidy government system and the low-quality, low-subsidy harambee system. Therefore, we depart from the conventional procedure and disaggregate the benefits and costs of secondary schooling by type of school and calculate separate rates of return to government schooling and to harambee schooling.

In the conventional measurement of the rate of return to (say) secondary education, the benefit stream is measured by means of an earnings function (see Mincer, 1974), of which the following, estimated first for a sample of primary school leavers and then for a sample of secondary school leavers, is an example:

$$(22\text{-}1) \quad \log W = a + bL + cL^2 + \sum_j d_j X_j + u$$

where

$\log W$ = log of earnings of the individual
L = the number of years of employment experience of the individual
$\mathbf{X}$ = a vector of other characteristics of the individual
u = a disturbance term

These cross-section earnings functions are used to simulate two time series, $\hat{W}_p$ and $\hat{W}_s$, representing the predicted wages, over their expected working lives, of primary and secondary school leavers, respectively. The difference between

the educational groups in predicted lifetime earnings is interpreted as a proxy for the cognitive skills or other marketable traits acquired in secondary education and is used as the estimate of the gross benefits of secondary education. When we calculate the internal *private* rate of return that equates the present value of these benefits to zero, we net out only the opportunity costs (wages forgone) of attending secondary school and the private direct costs.[11] When calculating the *social* rate of return, we must also take into account the public direct costs (subsidies).[12]

On the benefits side, disaggregation involves estimating earnings functions that will yield W_{ig} and $\hat{W}_{ih}$, representing the predicted wages, over their expected working lives, of government and harambee secondary school leavers, respectively. We do this with the following modification of equation 22-1:

$$(22\text{-}2) \quad \log W = a + bL + cL^2 + \sum_j d_j X_j + \sum_i e_i S_i + u$$

where S_i = dummy variables signifying type of school.[13] Excess demand for government schooling is sufficient to establish that the price elasticity of demand is zero. The comparison of the private rate of return to investment in government schooling, r_g^p, with the private rate of return to harambee schooling, r_h^p, provides the basis for assessing the extent to which user fees can be raised (subsidies lowered) without inducing a reduction in enrollments. Given that $r_g^p > r_h^p$, and there are no financial constraints, this procedure involves raising direct costs in our calculation of private rates of return until $r_g^p = r_h^p$.

Does the practice of reducing per pupil subsidies of secondary education by leaving further expansion to the low-cost, low-quality private sector result in the sacrifice of allocative efficiency? Because both the total costs and the total benefits of government schooling appear to exceed those of harambee schooling, our stylized facts did not permit even a preliminary answer to this question, which involves the comparison of social rates of return, r_g^s and r_h^s. The answer depends on whether the difference between the two systems in costs or the difference in benefits has the greater effect on the relationship of r_g^s and r_h^s. If $r_g^s \leq r_h^s$, then reducing per pupil subsidies in this way would not reduce the aggregate economic productivity of the school system. If $r_g^s > r_h^s$, then allowing the harambee system, as currently constituted, to increase its share of enrollments would result in expected output forgone.

The deficiencies of cost-benefit analysis as a guide to the allocation of resources between secondary schools and other types of investments such as health clinics or railroads are well known (see chapter 10, by Fields), and various more or less ad hoc adjustments have been devised to correct them (see Knight and Sabot, 1983*b*; Psacharopoulos and Hinchliffe, 1973). Our more limited aim of comparing social rates of return to two components of the secondary system as a means of assessing the efficiency consequences of reducing per pupil subsidies is less subject to some of the biases that have been a source of concern. The precise nature of the relationship between wages and the marginal product of labor in the public sector, for example, may have a large influence on the aggregate social rate of return to secondary education but

only a small impact on the relative rates of return to government and harambee schooling.[14] Wage-experience profiles derived from cross-section data are only crude approximations of earnings over the life cycle.[15] Again, the aggregate rate of return to secondary education is likely to be more subject to bias from this source than is the relative rate of return to government and harambee schools.[16]

We do, however, empirically examine the following four issues that could have an important bearing on relative private or social rates of return, and where appropriate we devise methods—described in detail below—of adjusting our estimates:

- We use more refined measures of human capital—scores on the O-level exams taken in form 4—to assess whether the lifetime earnings of government school leavers are higher than those of harambee school leavers because of the former group's higher level of skills. The difference could instead be due to credentialism, that is, to discrimination by employers on the basis of the worker's "old school tie."
- We have measures of time devoted to job search on leaving school (unemployment) that allow us to assess whether government and harambee school leavers differ in this regard and whether relative rates of return are sensitive to the observed differences.
- We assess whether relative rates of return must be adjusted for the difference noted above between government and harambee schools in wastage rates. The answer depends on whether the returns to schooling, as well as the costs, are a linear or nonlinear function of years of schooling.
- We assess the extent to which the difference between government and harambee school leavers in skill levels and earnings is due to the government system's greater tendency to select children from more educated backgrounds rather than to differences in the quality of schooling. To this end we estimate an education production function to isolate the effect of family background, independent of type of school, on performance on the exam at the end of schooling. We then simulate the difference between government and harambee school leavers in performance and in earnings if the two groups did not differ in family background.

Apart from opportunity costs (derived from the earnings function estimated for primary school leavers using data from our survey, described below), we do not have individual data on costs. In our rate-of-return calculations, all government school leavers are assumed to have paid the average current costs of government schools; similarly, all harambee school leavers are assumed to have paid the average current costs of harambee schools. Official government statistics provided our sources for the private and public cost data. Our estimates of private direct costs—tuition and board, uniforms, caution fees, activity fees, medical fees, books and equipment, and contributions to the building fund—are obtained from the *Annual Census of Primary and Secondary*

Schools (1979).[17] Our estimates of public costs are obtained from *The Appropriation Accounts, 1980–81*.[18]

The *Kenya Survey of Wage Employment and Education, 1980* is our source for the opportunity costs and returns to government and harambee secondary education. The survey was designed and administered in 1980 by a team that included one of the authors. The sample, containing nearly 2,000 employees, was randomly selected on an establishment basis, using a two-stage procedure, from among the wage-labor force of Nairobi.

For our purposes the survey has two strengths—accuracy and richness—though it also has a weakness. Data on wages collected from an establishment-based survey are likely to be more accurate than similar data derived from a household survey because the inquiry does not rely solely on the recollection of the employee; confirmatory information can be (and was) obtained from the employer. The richness of the data is a product of the specially designed questionnaire. Respondents were asked detailed questions about their educational and employment histories, their family background, and other things. One advantage is that it is possible to identify the type of secondary school attended and hence to compare the rates of return that are central to our analysis. The experience variable in our earnings functions is the actual number of years in wage employment rather than the usual crude proxy based on age and years of education. The variable indicating performance on O-level exams permits the test of competing hypotheses regarding the cause of the difference between harambee and government school leavers in earnings streams (essential for the measurement of the gap between the two types of school in gross *social* returns). It also permits us to estimate an education production function and to correct, if only crudely, for the bias in the measure of the gap that arises from the selectivity of the government system.

The weakness of an establishment-based survey such as the *Kenya Survey* for cost-benefit analysis is that the sample does not include those educated workers who are *not* in urban wage employment.[19] Our estimate of the relative rate of return to government and harambee schools may therefore be subject to sample selection bias. In particular it seems likely that a higher proportion of harambee school leavers than of government school leavers are not in urban wage employment and that those harambee school leavers who were unsuccessful in obtaining such employment are from the poorest-quality schools. If those schools have below-average costs as well as below-average returns, then our comparison need not be biased. If, however, the returns alone are below average, the implication would be that we are overestimating the returns to harambee schools relative to the returns to government schools.

Private and Social Rates of Return to Government and Harambee Schools and Some Adjustments

Table 22-4 presents estimates of the various earnings functions used in the analysis. In both equation 22-1, estimated for primary leavers, and equation

Table 22-4. *Earning Functions*

Independent variable	*Leavers*			
	Standard 7 or 8	*Form 4 or more*	*Form 4 or more*	*Form 4 or more*
Equation	(22-1)	(22-2)	(22-3)	(22-4)
Years of employment experience (L)	0.045	0.099	0.099	0.099
	(4.8)	(9.7)	(10.0)	(9.5)
(L^2)	−0.0005	−0.0016	−0.0019	−0.0019
	(1.6)	(4.3)	(4.6)	(4.2)
Harambee secondary school (S_2)[a]	—	−0.21	−0.024	—
		(2.9)	(0.3)	
Private secondary school (S_3)[a]	—	−0.20	−0.016	—
		(3.2)	(0.2)	
Government technical school (S_4)[a]	—	−0.15	−0.20	—
		(1.6)	(1.8)	
Post–form 4 schooling (E_5)[b]	—	0.64	0.30	0.42
		(10.9)	(4.4)	(6.5)
First division (D_1)[c]	—	—	1.00	—
			(8.5)	
Second division (D_2)[c]	—	—	0.70	—
			(7.6)	
Third division (D_3)[c]	—	—	0.47	—
			(5.5)	
Fourth division (D_4)[c]	—	—	0.27	—
			(3.1)	
Upper division (D_1 or D_2)[d]	—	—	—	0.41
				(7.7)
Constant	6.25	6.58	6.08	6.40
R^2	0.19	0.40	0.45	0.45
Number	458	508	456	456

— Not applicable.

Notes: The dependent variable is the log of monthly wages ($\log W$). The figure in parentheses beneath a coefficient is its t statistic.

a. Government school S_1 is the base.

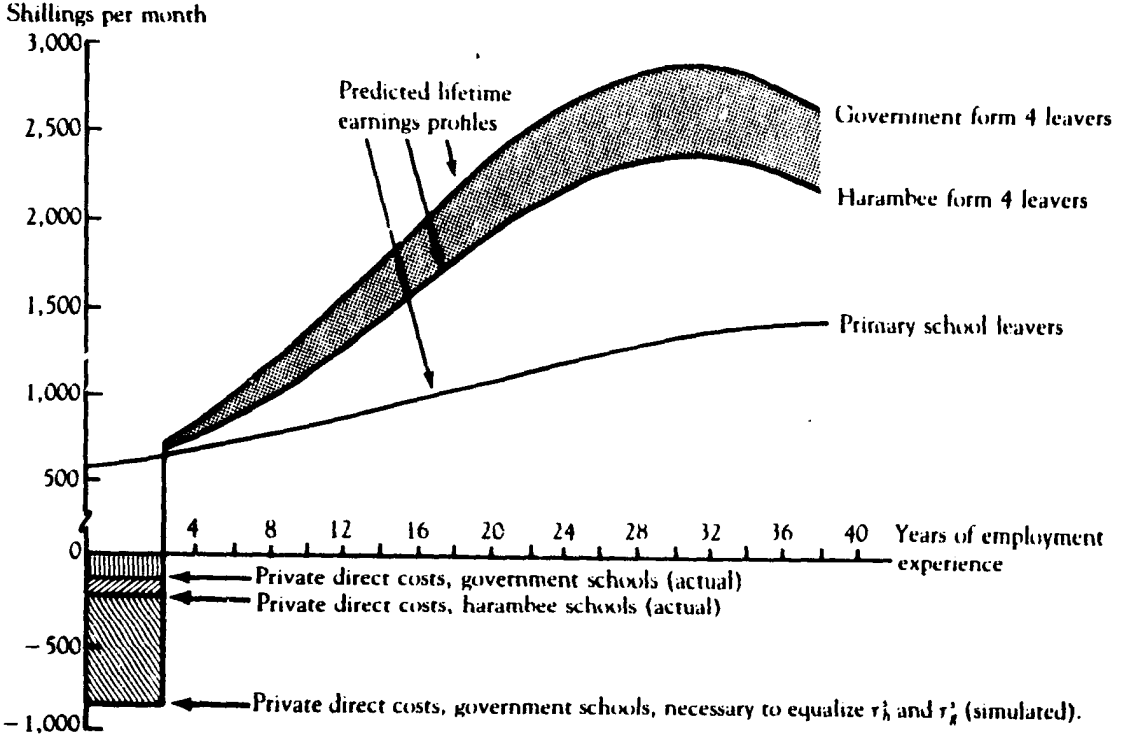
b. Lower secondary leavers is the base.

c. Failed or did not sit O-level exams is the base.

d. Lower divisions (third, fourth, or fail) are the base.

22-2, estimated for leavers at form 4 or later, the coefficient on the experience variable is positive and highly significant and the coefficient on the quadratic term is negative and highly significant. Differences between the two equations in constant terms and coefficients on the experience variables indicate that, as usual, the earnings profile of secondary school leavers lies above and rises more steeply than that of primary school leavers.

Figure 22-1. *Costs and Benefits of Government and Harambee Secondary Schooling*



Source: Armitage and Sabot (1983).

The coefficient on the harambee dummy variable in equation 22-2 is negative, large, and significant: the implication is that, if we standardize for employment experience, the earnings of harambee school leavers are considerably lower (more than 21 percent) than those of government school leavers. This estimate of the standardized differential in earnings may be biased, because in equation 22-2 the returns to experience are constrained to be the same for government and harambee school leavers. An F test on an unconstrained version of the equation (not shown), however, did not allow us to reject the null hypothesis that the returns to experience are the same for both groups. The F statistic was below the critical value, at the 5 percent level of significance.

Figure 22-1, a rendering of the lifetime earnings streams of primary school leavers, government school form 4 leavers, and harambee school form 4 leavers derived from equations 22-1 and 22-2, summarizes these findings. The lower shaded areas represent the opportunity cost of secondary schooling; the upper shaded area represents the higher gross private returns to government secondary schooling than to harambee secondary schooling.[22]

Table 22-5 presents our estimates of private and social rates of return to government and harambee schooling based on the data underlying the

Table 22-5. *Private and Social Returns to Secondary (Form 4) Education*
(percent)

Item	*Government schools*	*Harambee schools*
Base calculation		
Private return	14.5	9.5
Social return	13.0	9.5
Adjusting for credentialism		
Private return	14.5	9.5
Social return	13.0	9.5
Adjusting for wastage		
Private return	14.5	7.5
Social return	13.0	7.5
Adjusting for search time		
Private return	21.0	11.5
Social return	17.0	11.5
Adjusting for selectivity of government schools[a]		
Base private	15.5	11.0
Base social	13.5	11.0
Adjusted private	15.0	—
Adjusted social	13.0	—

— Not applicable.

a. The base private and social returns are recalculated because a slightly different specification of the earnings function underlying our estimate of returns is used to make the adjustment.

above-mentioned estimates of returns and opportunity costs and on the estimates of private and government expenditures presented in table 22-1. Confirming what the stylized facts strongly suggested, the private returns to government schooling are higher—50 percent higher—than the private returns to harambee schooling. The implication is that user fees in government schools would have to be raised substantially to equalize private returns in the two systems. Our simulations indicate that, to accomplish such an equalization, private direct costs in government schools would have to be raised from 1,557 shillings per year to 10,000 shillings per year (see figure 22-1).[21] The difference between what the government could charge, given perfect capital markets, and what it actually charges over four years is therefore in excess of 33,000 shillings. This sum is double the mean annual earnings of all workers in our sample, considered by some observers to be the urban elite; it is 3.5 times the mean annual earnings of the manual workers in our sample.

If, as we have assumed, the elasticity of demand for government schooling remains zero until private returns in the two segments of the system are equalized, the revenue potential of raising user fees is then simply the difference between current user fees and the maximum potential fee multiplied by aggregate enrollment in government lower secondary schools. This amount is 75,600,000 pounds, a sum that represents more than 300 percent of government recurrent expenditures on lower secondary education.[22] Capital market imperfections imply that it is not feasible to levy the maximum potential user fee without a decline in demand for government schooling. Nevertheless, the potential revenue associated with an increase in school fees is likely to be substantial.[23]

The private and social returns to harambee secondary schools are essentially the same. Adding the negligible government subsidies onto private costs of harambee schools increases total costs by only 9.2 percent. This increase does not measurably reduce the rate of return. There is, however, a gap between the private and social returns to government schools because per pupil subsidies in that system are far from negligible. Adding government subsidies onto private costs increases total costs by 133 percent. The result is that the social rate of return to government schools is some 13 percent, which is less than the private rate of return of 14.5 percent.

The gap between government and harambee schools in the social rate of return is less than the gap in private returns. Nevertheless, social returns to investment in government schools remain substantially higher than the social returns to investment in private schools. This difference suggests that, from the perspective of costs and benefits to the economy as a whole, not just to the individual or household, the government system is the more cost-effective system—output per shilling of input is higher in government schools than in harambee schools.[24]

The measured difference between the two systems in economic efficiency could be due to a difference in the quality of management. Alternatively, it could reflect increasing returns in the education production function. Recall

that total per pupil expenditures are substantially lower in harambee schools than in government schools. The returns to the extra 1,000 shillings per pupil per year spent in government schools may have substantially exceeded average returns. Educationalists generally presume that the learning curve, relating inputs on the horizontal axis and skills acquired on the vertical axis, has a logistic form, increasing rapidly at first, then more slowly. Kenyan secondary schools may be on the steeply sloped portion of an aggregate version of such a curve where a small increase in inputs yields a disproportionately large increase in outputs (Armitage and Sabot, 1983).

One implication of this efficiency differential for the assessment of government subsidies of secondary education is that a policy of reducing per pupil subsidies by allowing the relatively unsubsidized harambee system to provide a disproportionate share of new secondary places would entail allocative inefficiency. Such a policy would result in potential output forgone. Because of the higher total costs of the government system, however, the efficiency differential between the two systems is less than the 20+ percent differential between government school leavers and harambee school leavers in economic productivity estimated by our wage function. If, as hypothesized, the education production function is characterized by increasing returns, it may take only a small increase in the quality of harambee schools to reduce the difference between the two systems in gross social returns. Narrowing the gap between the two systems in total expenditure per pupil may therefore narrow the gap in social rates of return.

Just how robust are these assessments of the economic costs and benefits of reducing per pupil subsidies of secondary education in Kenya? The following adjustments of our estimates of relative private and social rates of return to government and harambee schooling provide a basis for judgment.

Adjusting for Credentialism

To what extent does credentialism account for the higher earnings of government than of harambee school leavers? To what extent is the difference in earnings due to the greater skill of government leavers as indicated by their superior performance (see table 22-3) on the nationwide form 4 exam? To answer these questions, we add to the wage function for form 4 or more (equation 22-2 above and in table 22-4) a set of dummy variables (D_j) signifying the division achieved on the O-level exams. The estimated equation 22-3 is presented in table 22-4.

Exam scores clearly have a powerful influence on earnings. The coefficients on the dummy variables increase monotonically and in large increments; all four are highly significant. The equation predicts that, if we standardize for other characteristics, a form 4 leaver who was placed in the first division will earn in excess of 100 percent more than a form 4 leaver who failed or did not sit the exam. Most striking is that adding exam scores to the explanatory variables entirely eliminates the influence of type of school on earnings. If we compare

equations 22-2 and 22-3, the coefficient on the harambee dummy (S_2) declines from -0.21 to -0.024 and is no longer statistically significant.

All of the difference in earnings between government school and harambee school leavers appears to reflect differences in skills; none appears due to credentialism.[25] Therefore, no adjustment needs to be made to our estimate of the rate of return to harambee schools; the rates of return in rows 3 and 4 of table 22-5 are the same as the base calculations.

Adjusting for Wastage

As documented in table 22-2, the dropout rate from harambee schools (59 percent) is greater than the rate of dropouts from government lower secondary schools (15 percent). Whether our estimates of rates of return have to be adjusted for differential wastage depends on whether gross returns to schooling are a linear function or an increasing function of the number of years of schooling. If the returns function is linear, then no adjustment need be made; if the cost function is linear, the rate of return per year of harambee school will be the same, irrespective of the number of years completed, as will the relative rates of return of government schools and harambee schools.[26] If, however, returns per year of harambee schooling are lower for form 2 than for form 4 leavers, our base estimates of rates of return to harambee schooling are biased upward. To assess this issue of linearity, we calculate the rate of return to two years of harambee schooling. This involves estimating a wage function for form 2 harambee school dropouts and predicting the lifetime stream of net benefits, taking into account only two years of forgone primary wages and direct costs. The result of these calculations is a rate of return (private and social) of 6.5 percent, considerably less than the rate of return to four years of harambee schooling (9.5 percent).

To arrive at an adjusted aggregate rate of return to harambee schools, we weight the rates of return to forms 2 and 4 by the proportions of students who left harambee school at those levels. Rows 5 and 6 of table 22-5 indicate that the adjusted rate of return is 7.5 percent, thereby widening the gap between government and harambee schools in private and social rates of return.[27]

Adjusting for Search Time

No wages are earned during the time spent searching for a job on completion of schooling.[28] We did not take into account this period of search when we predicted the lifetime earnings of school leavers and calculated the base rates of return. Because there are large differences between harambee and government school leavers in search time, relative rates of return may be biased by this omission. Thirty-five percent of government school form 4 leavers found a wage job immediately, compared with 19 percent of harambee school leavers. The average time taken to find a wage job for government school leavers was

9.5 months, as compared with 18 months for harambee school leavers and 32 months for primary school leavers.

Rows 7 and 8 of table 22-5 show the results of taking into account search time.[24] Because primary school leavers take a longer time to find a job than secondary school leavers, the rates of return to both government and harambee schools are higher than in the base calculation. The returns to government schools rise more, however. Therefore, as in rows 5 and 6, the gap between government and harambee schools in both private and social rates of return is widened by the adjustment.

Adjusting for Selectivity of Government Schools

Although we have confirmed that the difference between government and harambee school leavers in wages results from differences in cognitive skills, the question remains: how much of this difference in cognitive skills is due to the higher quality of government schools, and how much is due to the higher achievement at the start of secondary schooling of government school entrants and to their higher ability and socioeconomic background? If, to take an extreme case, all of the difference in skills is due to the selectivity of the government system, then there would be no gap between the two systems in either gross private or gross social returns. Because of differences in costs, net private returns would still be higher in the government system, but net social returns would actually be higher in the harambee system.

We attempt to answer this question with regard to socioeconomic background; because we do not have measures of cognitive skill levels at the beginning of secondary school, we cannot answer it with regard to this dimension of selectivity. Recall, however, that we were able to show for a subsample of form 4 leavers that there is no significant difference in ability between government and harambee school leavers. Family background may, however, be partly serving as a proxy for differences in achievement at the start of secondary school. Table 22-6 presents probit estimates of the following simple educational production function for form 4 leavers, together with predicted probabilities for different family background groups and for government and harambee students:

$$\text{Prob}(H = 1) = \Phi(\mathbf{X}'\mathbf{B}) \tag{22-5}$$

where H is a dichotomous variable that takes the value 1 where the individual obtained a high score (division 1 or 2) on the O-level exam. The vector of exogenous variables, X_i, includes P_j, the family background dummies; S_j, the type of school dummies; and, to capture the cohort effect, A_j, the age of the worker. Φ is the cumulative-unit normal-distribution function.

The three coefficients on the family background variables are significantly positive. They indicate that the probability of attaining a high grade increases monotonically as the educational level of the parents of students increases.

Table 22-6. *Probit Educational Production Functions*

Independent variable	*Coefficient*	*Probability of attaining high grade*[a]		
		P	*Government leaver*	*Harambee leaver*
One parent with no education, one with primary (P_2)	0.337 (2.1)	P_1	.34	.06
		P_2	.47	.11
		P_3	.55	.15
		P_4	.71	.27
Both parents with primary, or one with secondary or more; one with none (P_3)	0.539 (3.5)	Average[b]	.47	.10
One parent with primary, one with secondary or more, or both with secondary or more (P_4)	0.979 (4.3)			
Harambee secondary school (S_2)	−1.159 (4.9)			
Private secondary school (S_3)	−0.903 (4.9)			
Government technical school (S_4)	0.153 (0.5)			
Age (A)	0.010 (0.5)			
Constant	−0.699			
χ^2	78.2			
Number	496			

Note: Figures in parentheses are *t* statistics.

a. The probability that Y = 1 is the area under the standard normal curve between $-\infty$ and X'B. Probabilities are predicted for individuals with mean age.

b. Averaged over all family background groups, with weights equal to mean family background for sample.

Nevertheless, the coefficient on the harambee dummy (S_2) is of larger absolute size and more highly significant than the coefficients on any of the family background variables. The predicted probabilities more clearly illustrate these findings. In both the government and the harambee systems, there is considerable variation in performance on O-level exams by family background. The impact of type of school on the probability of attaining a high grade on the O-levels, however, appears to be larger still: it is nearly five times higher for government school leavers (0.47) than for harambee school leavers (0.11). For reasons noted above, the composition by family background of the two secondary systems is not very different (see the text table above). The effect of family background on performance in school is therefore unlikely to have a large effect on the difference between government school leavers and haram-

bee school leavers in predicted cognitive skill levels and thus in predicted wages and returns to secondary schooling. The results of simulating the returns to government and harambee schooling in the absence of government school selectivity by family background, presented in rows 5 and 6 of table 22-5, confirm this point.[30] The gap in both private and social returns narrows only marginally.

In sum, although our adjustments are not comprehensive, neither do they give conflicting signals. Two of our four adjustments—for credentialism and for the selectivity of government schools—have little impact on the relative rates of return of government and harambee schools. The other two adjustments—for differences in length of job search and in wastage rates—widen the gap between government and harambee schools in both private and social rates of return. The widening of the gap in private returns implies that our simulations with the base-rate calculations underestimated the increase in user fees necessary to equalize private returns to investment in the two systems. It appears that 8,000 shillings per annum would not be sufficient. The widening of the gap in social returns implies that allowing the harambee system to increase its share of enrollments entails somewhat higher efficiency costs than we had supposed.

Access to Government Schools and Family Background

Our assessment of the consequences for the distribution of schooling of reducing per pupil subsidies is based on estimates of a simple educational attainment function. Using binomial probit, we obtain maximum likelihood estimates of the parameters in the following reduced-form equation:

$$\text{Prob}(G = 1) = \Phi(\mathbf{X}'\mathbf{B}) \tag{22-6}$$

where G is a dichotomous variable that takes the value 1 where an individual attended a government secondary school (and thus benefited from government subsidies) and 0 where the individual did not; $\mathbf{X}$ is a vector of exogenous variables. The exogenous variables include a set of four dummy variables signifying the education level of the parents of the individual. In another specification of the education attainment function, estimated only for individuals whose fathers were farmers, a variable signifying the size of the farm is also included among the exogenous variables. $\Phi(\mathbf{X}'\mathbf{B})$ is the cumulative-unit normal-distribution function.[31]

Table 22-7 presents estimates of our probit educational attainment function and predicted probabilities of attending a government secondary school for various family background groups. In equation 22-7, estimated for the entire sample, the coefficients on the parents' education variables are positive and increase monotonically; all are significant. As we noted above, the predicted probabilities of reaping the very large private benefits from the subsidies of government education rise sharply with the educational level of the parents.

Table 22-7. *Probit Educational Attainment Functions*

Independent variable	Coefficient (1)	Coefficient (2)	*Probability of going to a government secondary school*[a]	
Equation	(22-7)	(22-8)		
One parent with no education, one with primary (P_2)	0.261	0.181	*From (22-7)*	
	(2.9)	(1.2)	P_1	.16
			P_2	.23
			P_3	.33
Both parents with primary, or one with secondary or more; one with none (P_3)	0.581	0.597	P_4	.51
	(6.1)	(3.4)	*From (22-8)*[b]	
			1.5 acres	.17
			3.5 acres	.19
			7 acres	.19
One parent with primary; one with secondary or more, or both with secondary or more (P_4)	1.042	0.743	15 acres	.21
	(6.1)	(1.3)	25 acres	.24
Born in Nairobi (N)	0.176	—		
	(3.8)	—		
Age (A)	−0.043	−0.041		
	(8.1)	(4.6)		
Acreage of farm (A_c)	—	0.010		
		(2.5)		
Constant	0.355	0.319		
χ^2	193.2	48.0		
Number	1,650	539		

Note: Figures in parentheses are *t* statistics.

a. The probability that $Y = 1$ is the area under the standard normal curve between $-\infty$ and $\mathbf{X'B}$. Probabilities are predicted for individuals born outside Nairobi, at the mean age.

b. Probabilities are predicted for individuals with uneducated parents, at the mean age.

Access to the government secondary system is meritocratic; selection is based largely on performance on the examination at the end of primary school. The education production function we estimated (table 22-6) therefore suggests one explanation for the relationship between parents' education and access to government secondary schools. It indicated that the education level of parents matters to performance in both high-quality (government) and low-quality (harambee) schools.[12] Though we have no direct evidence, there is a strong presumption that, standardizing for school quality, the educational level of parents is also positively related to performance in primary schools.[13] Moreover, children of more educated parents are likely to attend primary schools of above-average quality because of the concentration of both educated parents and high-quality primary schools in urban areas.

Our second educational attainment function (equation 22-8 in table 22-7) indicates that family wealth has an influence on the probability of attending a government secondary school independent of parents' education. The equation is estimated only for those workers whose fathers were farmers and includes a measure, A_c, of the size in acres of the family farm among the

independent variables. Although coefficients of the parents' education variables continue to be positive and increase monotonically, they are reduced in both magnitude and significance relative to equation 22-7. The coefficient on the size-of-farm variable is positive and significant. For students with uneducated farmers as parents, the predicted probability is some 40 percent higher for those from farms of 25 acres than for those from farms of 1.5 acres. This relationship may indicate a nonmeritocratic component in the influence of family background on access to government secondary schooling.

The equations represented by table 22-7 measure the relationship between the socioeconomic status of the parents of the workers in our sample and the educational attainment of the workers. To confirm that the effect of family background is not merely a historical phenomenon, we also estimated by probit the relationship between the educational attainment of the workers and the probability that their children would attend a government secondary school. The results (not shown) for the younger two generations are qualitatively the same as those for the older two generations: the richer the family, the greater the likelihood that it will benefit from government subsidies of secondary education.[14] This outcome is especially perverse, because in Kenya, as in many developing countries, the government generates much of its revenue from regressive import and excise duties rather than from progressive income taxes.[15]

Conclusions

The private rate of return to investment in secondary education is markedly higher for children who attend government secondary schools than for children who attend harambee schools. The reason is partly the lower private costs of government schooling and partly the higher gross returns. The latter phenomenon is the result of the higher level of cognitive skills of government school graduates.[16] Moreover, a positive relationship between family income and the probability of reaping the subsidies to government schools contributes to the difference in private rates of return. These findings provide the basis for efficiency and equity arguments for reducing per pupil subsidies in government schools by selectively increasing user fees.

Our simulations indicate that it would take an increase in user fees in excess of 8,000 shillings per student per annum to equalize private rates of return in the two systems. The revenue potential of user fees in government schools is therefore substantial—more than 300 percent of government per student recurrent expenditures on secondary education. In part, the revenue potential is so large because in the relevant range the price elasticity of demand for government schooling appears to be so small. It must be emphasized, however, that, in practice, the revenue potential will be less than the amount indicated because of the inability of some families to borrow in formal credit markets to finance schooling. Nevertheless, a substantial proportion of students in gov-

ernment schools are from families with the means to pay the cost of their children's education who would be willing to do so in the absence of a highly subsidized alternative. The willingness of relatively low-income families paying high fees to send children to low-quality harambee schools that yield low private returns provides the evidence for the latter assertion.

Government schools are unlikely to be underutilized as a consequence of even substantial increases in user fees, nor would a reduction of per pupil subsidies result in a deterioration of school quality, as private funds would simply substitute for public funds, leaving per pupil expenditures unchanged. There is some danger of inefficient changes in the composition of the student body of government schools and of a reduction in the size of the secondary system as a whole as a consequence of increases in user fees. There is some reason to believe that those students from uneducated (poor) backgrounds forced to withdraw from the school system by the rise in fees will be the most able. The reason is that students who gain access to government secondary schools without having the advantages of educated parents are likely to be unusually bright. If the increases in fees are uniform, relatively bright but poor students may terminate their education and may be replaced by less able students from higher-income families who would otherwise have gone to harambee schools.

To avoid this eventuality, increases in user fees could be discriminatory. In effect, a needs-based scholarship program could ensure that admissions decisions would continue to reflect solely meritocratic criteria. Such a program is bound to suffer from one of the two following problems: if the criteria for awarding scholarships are too loose, the scholarship program will cost too much; if the criteria are too tight, then the government secondary system may lose students who would qualify on meritocratic grounds. Though the difficulties of assessing ability to pay should not be underestimated, this system is likely to distribute government subsidies more equitably than the current system. At present, the least needy have the highest probability of obtaining a subsidy. The gap between what the government could charge and what it does charge is equal in value to income from two years of work at the mean urban wage. One alternative to raising school fees and providing scholarships to the needy would be to raise fees and then to provide all students with loans to finance the private costs of a government secondary school education. This approach would have the advantage of avoiding the application of means tests. The disadvantage lies in the administration of a program for repayment. In Kenya the "pay-as-you-earn" tax system could be used for this purpose.

Reducing per student subsidies by allowing low-subsidy harambee schools to satisfy an increasing proportion of the growing demand for secondary schooling has been a de facto policy of the Kenyan government for more than a decade. Our results suggest that, for reasons of allocative efficiency, the case for this approach is actually not as strong as the case for raising user fees in government schools. The difference between the two systems in social rates of return indicates that harambee schools are less efficient than government schools,

that is, they raise worker productivity less per shilling of total expenditure. Government regulation of quality in harambee schools together with small subsidies (relative to those given to government schools) for quality-improving purposes, however, may substantially curtail the efficiency costs of this means of reducing per student subsidies in the entire secondary system.[17] Such would be the case if the difference in efficiency between the two systems was explained by the higher total expenditure per pupil in government than in harambee schools and by the finding that Kenyan secondary schools lie on a portion of the education production function that is characterized by increasing returns.

Notes

1. The wider gaps observed in the structure of earnings in low-income countries than in high-income countries could be attributed to the relative scarcity of educated labor in the former. For evidence of substantial compression of the educational structure of wages and reduction in the inequality of pay in East Africa as a consequence of the expansion of secondary education, see Knight and Sabot (1983*a*).

2. Harambee is a Swahili word meaning "let's pull together": harambee schools are those built and financed by the local community.

3. The exchange rate in 1980 was 7.57 shillings to the U.S. dollar. The mean annual earnings of the manual workers in our sample was about 9,500 shillings. Per capita income was about $420 in 1981. Throughout, our analysis compares government with harambee schools to the exclusion of other private schools. The reason is the heterogeneity of the "other" category. Some few of these private schools are very good and very costly; most are of very poor quality and low in cost. Thus this category would have had to be further disaggregated, and some key data were not available for the component parts. The omission does not pose a serious problem, as it appears that harambee schools are representative in key respects of the larger group of low-cost private schools.

4. We do not suggest that harambee schools are attempting to offer a qualitatively different type of education, for example more practical or vocational training rather than an academic education. Their curriculum is oriented toward preparation for the same lower exams at the end of secondary school that are taken by government school students.

5. For detailed discussion of the nature of the ability tests and the influence of ability on accumulation of cognitive skills and on earnings, see Boissiere, Knight, and Sabot (1985).

6. Predictions are made with wage functions presented in table 22-2. They do not allow for any compression of the educational structure of wages that might result from educational expansion.

7. In this model, whether an individual demands secondary schooling depends solely on whether the expected present value of net benefits is positive and on whether the individual chooses between segments of the secondary system solely on the basis of the relative magnitude of present values.

8. Government guidelines call for holding expenditures for education to 30 percent or less of the recurrent nondefense budget. For 1981–83, the share was estimated to be nearly 35 percent.

9. The estimated net enrollment ratio in primary schools in 1981 is still only 0.83. Hence, in addition to keeping pace with population growth (3.8 percent per annum),

the primary system must expand sufficiently to enroll the 17 percent of school-age children who are not yet in school.

10. Although the returns to government schooling are high if people are capital constrained, a rise in user fees may force them to withdraw from the government system. A reduction of government school fees to a level below that of harambee school fees will mean students' withdrawal from the secondary school system entirely. When fees in government schools are raised above those in harambee schools, people facing liquidity constraints may be forced to switch into the harambee system even though the private returns are lower.

11. If the net benefits of secondary education are B_t per year, extending over a period of n years, the internal rate of return (r) to investment by an individual in four years of secondary education (during which B_t is negative) is calculated by solving the following equation for r:

$$\sum_{t=1}^{n} \frac{B_t}{(1+r)^t} = 0.$$

12. Such estimates of social returns of course do not take into account the externalities mentioned above that are generated by the secondary system, which would tend to increase the social returns.

13. We also estimate a version of equation 22-2 in which S_i interacts with the other dependent variables, but we conclude, using F tests, that this is not a superior specification.

14. The assumption here is that, although there will be a large difference between primary and secondary school leavers with respect to their proportions in the white-collar intensive public sector, the difference between government and harambee secondary school leavers in this regard will be relatively small.

15. There are likely to be differences in profiles between cohorts of school leavers because of the changes in the education-occupation matrix associated with rapid educational expansion. See Knight and Sabot (1981).

16. Recall that both the government and the harambee secondary systems have been growing very rapidly.

17. The survey is administered by the Central Bureau of Statistics in collaboration with the Ministries of Basic and Higher Education. The figure for average private expenditure per student for harambee schools is a weighted average of the expenditures in assisted harambee schools and unaided harambee schools, where the weights are the proportion of total harambee enrollments in the two types of schools. Similarly, the figure for private expenditure per pupil for government schools is a weighted average of the expenditures in the various types of government schools where the weights are the proportions in the different types of government schools.

18. The government expenditure figures are aggregates; to obtain per pupil expenditures, it is necessary to use the appropriate enrollments. Although public expenditures on harambee schools are confined to assisted harambee schools, the appropriate enrollment figure for our purposes is total harambee enrollments. Because our other costs and our returns data refer to 1979, it is necessary to deflate government expenditures. To do so we use 12 percent, the official government estimate of the rate of inflation for 1980.

19. The large majority of rate-of-return studies share this weakness of focusing exclusively on urban wage employment. See Psacharopoulos and Hinchliffe (1973).

20. We assume that the wages of primary school leavers are an accurate measure of opportunity costs of secondary school leavers. If entrance to secondary schools is meritocratic, this measure of opportunity costs will be too low. Moreover, to the extent that government secondary entrants are of higher quality than harambee entrants, the opportunity costs of the former will be still higher.

21. The 6,372-shilling difference between the total cost of schooling (3,368 shillings per annum) and the fee that could be charged, given perfect capital markets, would be a tax on educational expenditure.

22. See Bertrand and Griffin (1983). This estimate ignores the general equilibrium effects of a rise in user fees: if people spend more of their income on education, they may spend less on other goods that the governmnent taxes, which will have a negative impact on public revenues, or less on goods that are subsidized, which will have a positive impact on public revenues.

23. High-cost, high-quality private schools enroll only a small proportion of secondary students. Some expansion could drain revenue from the government system.

24. The actual cost of one shilling in public money is greater than the nominal cost because of the administrative and efficiency costs of collecting public money via the tax system. Taking this factor into account would lower the social return to government schools. Harambee schools, however, are often built and supported with voluntary labor and other inputs that are not "costed," in which case one shilling of private money may also be an underestimate of resources used.

25. The fact that government and harambee school leavers with the same exam scores are predicted to earn the same wages reinforces our assumption that the only characteristic that differentiates government and harambee leavers is their exam results.

26. Strictly speaking, linearity of wages in education does not imply constancy in rate of return over education of different lengths, because the length of the working life decreases as years of education increase. This qualification is unlikely to be quantitatively important.

27. Because so few pupils drop out of government school, there is no need to adjust these returns.

28. School leavers may have obtained income from other sources during this period. The survey does not yield estimates of such income.

29. The following procedure was adopted: when we predict the lifetime wage profile for primary school leavers we impose zero wages for the first two years, a third of a year's wage for the third year, and wages in the Tth year equivalent to $(T - 2.7)$ years of experience. When we predict the wage profile for government secondary school leavers, the wages for the first four years after primary school are zero as before. In the fifth year, 0.2 of a year's wages are imposed, and in the Tth year wages equivalent to $(T - 4.8)$ years of experience. For harambee school leavers zero wages are imposed for the first five years after primary school, in the sixth year half of a year's wages, and in the Tth year wages equivalent to $(T - 5.5)$ years of experience.

30. The simulation was conducted as follows: wage function 22-3 in table 22-4 was reestimated (see equation 22-4), and we substituted for the disaggregated set of dummies the more aggregate exam score variable used in the probit education production function. We then substitute the O-level scores for the graduates of the two types of school that were predicted when family background is set at the sample mean into the wage function to predict, in turn, the respective earnings streams for the graduates from the two types of school. The simulation removes the part of the higher cognitive achievement and earnings of government school leavers due to their more educated family background.

31. Note that in this model the coefficients do not represent the marginal change in the probability associated with each independent variable as they do in a simple linear probability model. For heuristic reasons, therefore, in our results, predicted probabilities for various representative groups are presented.

32. This relationship is not unique to Kenya. For reviews of studies that have documented such a relationship in other contexts, see Alexander and Simmons (1975) and Bridge, Judd, and Moock (1979).

33. Virtually all primary education is provided by the government; there is no equivalent to harambee schools at the primary level in Kenya.

34. Kenya is not unique in this regard. For evidence of a similar outcome in the United States, see Hansen and Weisbrod (1969), and in Colombia see Jallade (1974).

35. See Fields (1975*a*) for evidence that the overall incidence of taxes in Kenya is regressive.

36. There is some expectation that the scarcity rents earned by the highest achievers in secondary schools may be reduced over time. See Knight and Sabot (1983*a*).

37. Such as buying textbooks, hiring better-trained teachers, and reducing teacher/student ratios.